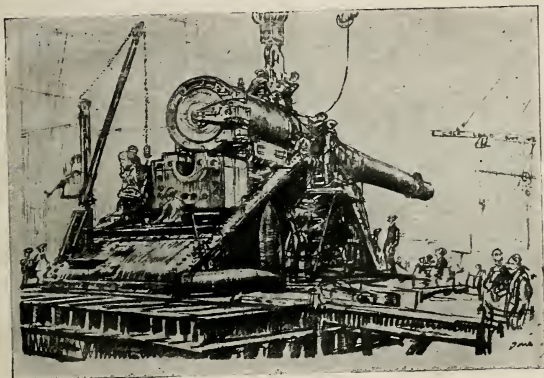


940.343
✓

BRITISH WORKSHOPS AND THE WAR



By

THE R^t H^{on}. CHRISTOPHER ADDISON.
P.C..M.P.


T. FISHER UNWIN, LTD.
1, ADELPHI TERRACE, LONDON
1917

PRICE THREEPENCE

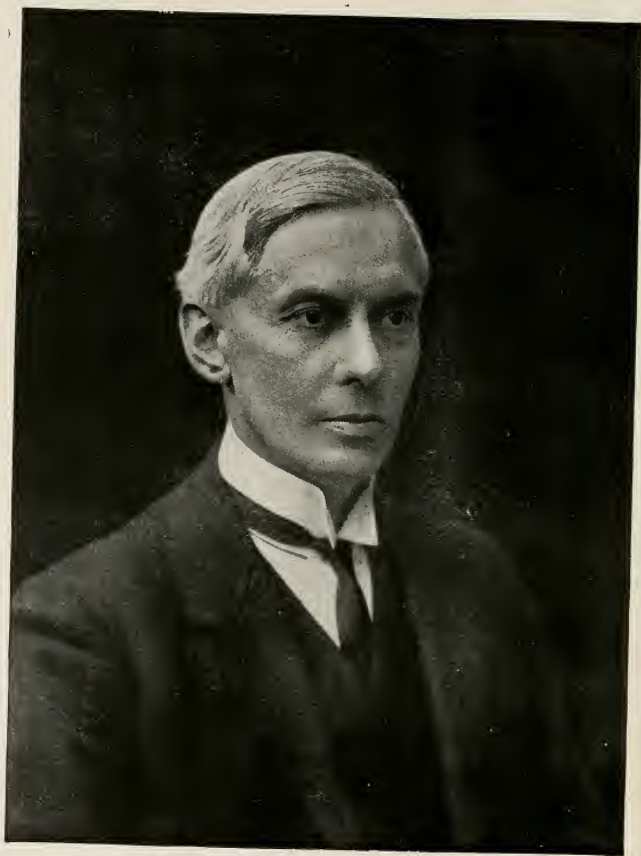
Walter Clinton Jackson Library
THE UNIVERSITY OF NORTH CAROLINA AT GREENSBORO
Special Collections & Rare Books

WORLD WAR I PAMPHLET COLLECTION

BRITISH WORKSHOPS
AND THE WAR



Digitized by the Internet Archive
in 2010 with funding from
Lyrasis Members and Sloan Foundation



Russell & Sons, London
CHRISTOPHER ADDISON, P.C., M.P.

BRITISH WORKSHOPS AND THE WAR

BY

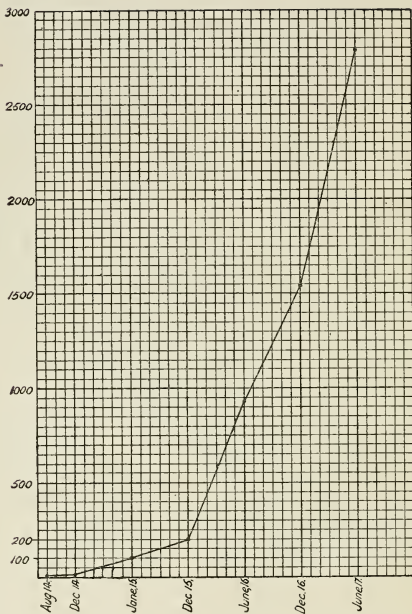
THE RT. HON. CHRISTOPHER ADDISON

P.C., M.P.

T. FISHER UNWIN, LTD.
1, ADELPHI TERRACE, LONDON

1917

Spec Coll
UF
545
G7A4



GRAPH SHOWING THE INCREASE IN PRODUCTION OF
MUNITIONS BY WEIGHT.

For purposes of comparison the production in June, 1915, when the Ministry of Munitions was founded, is taken as 100.

BRITISH WORKSHOPS AND THE WAR*

IT is a little over two years since a small party of us gathered with Mr. Lloyd George, one Wednesday afternoon, in No. 6, Whitehall Gardens. We were about to open a munitions shop. There was to be one aim and one aim only—to obtain the goods and make delivery of them to the Army. No other interests and no considerations of leisure were to be entertained. A process of man-grabbing was also resolved upon. We were to seek out capable and trustworthy men and to secure their help in the great task on the same terms.

Such was the beginning of a story which I trust that, some day, someone more skilled in the art of narrative than I am will tell in all its romantic interest with faithfulness and with affection. It will be a story of disappointments many, of difficulties manifold and often unexpected, of expedients without end, and of resolute determination by which those difficulties were steadily overcome. It

* A speech delivered in the House of Commons on the work of the Ministry of Munitions, June 28, 1917.

will be a story of improvisations gradually leading up to the formation of an organization which, assuming, or having forced upon it, first this function and then that, became at last as prodigious in its proportions as in its output of munitions. It will be a story of the courage and uncanny insight of Mr. Lloyd George, of the labours of a band of helpers of an unique and splendid character and of the untiring and patriotic efforts of men and women, employers and employed, who by their collective efforts have provided an imperishable tribute to British genius and resource.

HOW EXPLOSIVES HAVE BEEN PROVIDED.

The Department of Explosives Supply is the oldest Department of the Ministry of Munitions, and was the first to become organized. Before the formation of the Ministry, Lord Moulton and a band of able men whose services he had secured had already embarked on a scheme of production on a great scale. But the demands of the artillery programme, as it was formulated in the latter half of 1915, were such that it was necessary to plan for the erection of large additional factories. The designing and equipment of these factories, as of those which had been begun before, were undertaken by Mr. Quinan, the American engineer, and in the great works at Queensferry, Gretna, and elsewhere we have become possessed, through Mr. Quinan's genius, of factories which to a very large extent will be of permanent value to peace industries.

They were erected at such a pace that what were untouched green fields one year were the sites a year later of great establishments capable of dealing with the raw materials of minerals or cotton, and of working them up into finished explosives in great quantities every week.

As an example of the value which we are deriving from these national explosives factories, I may mention that, in a group of T.N.T. factories which have been operating for the longest period, a capital expenditure of one and a half millions has provided us with capacity which has already produced explosives at a cost of three and a half millions which, at the contract prices being paid when the factory was under construction, would have cost the country seven millions.

The present cost of production of T.N.T. at Queensferry, exclusive of interest and amortisation, is $8\frac{1}{2}d.$ per lb. The cost in the market when this factory was started was $1s. 9d.$ per lb.

During the later months of 1916 it was decided to erect a large additional factory for the production of a certain explosive for which we had hitherto been mainly dependent upon American supplies. The American firm of Dupont generously sent over their experts and gave us great assistance in the planning of it. The Cabinet, however, recently decided not to proceed further with the work, the grounds for this decision being that we could now count upon the active support in the War of the great Republic in the West, and that a great saving, in money and material as well as in tonnage, would

8 British Workshops and the War

thereby be effected, seeing that from three to four tons of raw materials were required to be shipped for every ton of finished explosive produced.

For a long time the output of explosives was in advance of the output of shells and other forms of ammunition. But during the last few months we have been able to balance the one with the other. Some conception of the magnitude of the production of explosives in this country may be formed from the fact that in March, 1917, the capacity for the output of high explosive was more than four times that of March, 1916, and twenty-eight times greater than that of March, 1915.

A DISAPPOINTMENT FOR GERMANY.

The Explosives Supply Department, of which Lord Moulton is Director-General and Sir Keith Price Deputy Director, is, of course, intimately concerned with the great chemical trades. It is responsible for the sulphuric acid necessary for the manufacture, not only of explosives, but of superphosphate and artificial manures generally, as well as for that of a great many other commodities. Under recent arrangements with the Food Production Department, we have started a section of the Explosives Supply Department for the provision of all the artificial manures which are required. By our control of the iron and steel industries, we are able to provide the basic slag that is wanted, and I have little doubt that we shall be able to meet the war programme, which includes more than one

million tons of super-phosphate, nearly half a million tons of basic slag, and a quarter of a million tons of sulphate of ammonia.

Hitherto this country has been entirely dependent upon Germany for its supplies of potash and I noticed in the papers the other day a statement to the effect that the Germans expect after the War to hold us to ransom on this account. I see no objection to their knowing that, in this respect, they will be disappointed. Thanks to the ingenuity of Mr. Kenneth Chance and other gentlemen working with him, a process has been discovered whereby great quantities of potash may be obtained; and we shall be able to provide every ounce of potash that the optical glass trade requires, with some surplus for the needs of agriculture.

The production of sulphuric acid, with the hearty co-operation of the chemical trades, has necessarily undergone a great development, not only in private works but in our national factories. Especially is this the case with regard to the strong fuming variety, of which the present capacity for production in this country is more than fifteen times greater than it was before the War, while it is being produced at much less cost.

It is sometimes said that the progress of a country may be measured by the quantity of sulphuric acid which it requires per head of its population and there is a good deal of truth in this statement. Whatever arrangements are made for the future, it is essential to secure that sulphuric acid is made available to *bona fide* users at fair rates, for if this is done it

should lead to the establishment of an important group of new industries.

GUN AMMUNITION AND FUZE PRODUCTION.

The great new National Factories for shell and fuze production have come into their full bearing during the past year and we have been able also to reap the fruits of the work of the Boards of Management which were established throughout the country in accordance with the scheme of organisation designed in the early days of the Ministry and carried out under Sir James Stevenson. These Boards direct the operations of local co-operative groups as well as of a number of factories which are described as National Shell Factories, and they superintend the execution of an infinite number of local contracts. They are responsible in fact for about a quarter of our total shell output and we are indebted to them for many valuable suggestions resulting in improvements and economies in the manufacture of different munitions.

The variety of the productions, under Sir Glynn West's Department, of gun ammunition supply is only paralleled by the volume and improving quality of their output. The great National Projectile Factories for the production of the heavier natures of shell have been in full operation during this year and produced in March exactly one-third of the total output of these heavy natures of shells.

Some impression can be obtained of the diverse processes for which this Department is responsible

by considering for a moment the manufacture of a single round of ammunition. Apart from the more obvious constituents, it is necessary to obtain and work up emery stone, cryolite, calcium carbide, magnesite, wolfram ore, acetone, carborundum, nickel, bauxite, nitrates, oil, cotton, antimony and many other items from different countries. Forgings and castings must be supplied here and there, brass rod and stampings, an infinity of machining operations must be done, along with the superintendence of equipments, the ordering of the machinery, the manufacture, distribution and supply and use of hundreds of gauges, the assembling of ingredients from different works in appropriate centres, the calculation of the raw material, the arrangements for transport, and so forth, making up such a multitude of operations per week that they present collectively manufacturing and other problems of the greatest magnitude, as regards organisation, production and direction. It all runs so smoothly now, the supplies and processes of one department operating with those of another, that the country is scarcely aware that it is going on. It is a result which could only have been secured by the hearty co-operation of carefully picked staffs at headquarters, of engineers, manufacturers, inspectors, transport officers and others in the different districts, assisted by the goodwill and patriotic and continued devotion of business men and workpeople from one end of the country to the other. Recently we reached such a state of production that we have been able to divert certain of our national factories,

in whole or in part, to assisting other sections of the munitions programme.

A NEW COMPONENT.

After extensive trials at the front, it was found a few months ago that a component of a new type possessed great advantages for certain purposes over any which had previously been produced. At first it seemed doubtful whether we should be able to produce any large quantity in time for the spring offensive, but happily, with the co-operation of all the departments concerned, we were able to provide a large supply in a short time, and the result has proved of the greatest value in facilitating the advances at the front, and in saving life.

Again, during January last, it appeared that we might possibly be behindhand in the accumulation of the great reserve of field gun ammunition asked for, but the requirements were fully met in good time and, notwithstanding the enormous expenditure of gun ammunition, during the first nine weeks of the present offensive, the stock of filled shells had only fallen by 7 per cent.

STRUGGLE AND VICTORY.

These results have not been easy of attainment. We have had to get ammunition in enormous quantities, working with a new explosive mixture, training gauge-makers and other operatives, building factories, and making machinery all at the same time. I remember how when first one difficulty

cropped up and then another, even the sanguine temper of the Prime Minister sometimes showed signs of wear. There were endless difficulties over obtaining an efficient detonator, difficulties over gauges and, above all, over the different types of fuzes, with a perpetual struggle against "duds" on the one hand and "prematures" on the other. It seemed sometimes as though we fought our way through one difficulty only in order to discover another. It was like a man climbing a mountain, conquering with joy and expectation the peak in front of him, only to find another and a more difficult one before him. But our work has not been fruitless and our soldiers on the ridges of Vimy and Messines can now see the plain beyond.

In those early days Sir Eric Geddes handled with singular courage the provision of new filling factories and their installation with machinery. I remember him often saying: "It will be so many months before you begin to see a big rise of output." The plans were well and truly laid, but it was a time of waiting and difficulty which, looking back upon it now, seems almost like a nightmare.

Many of our filling factories, like the shell factories, are worked by voluntary Boards of Management, and, in this way, we are able to make full use of the services of many able men in each district. And here I would like to refer to the ingenuity and boldness of resource shown by Lord Chetwynd in the management of his great filling factory. It is to him that our army in the field owed a great proportion of their earlier supplies

of heavy ammunition. The whole work is now under the direction of Colonel Milman, and the National Filling Factories, employing about 100,000 persons, now fill about 85 per cent. of the shell ammunition. The cost of filling has been reduced by 40 per cent. as compared with a year ago.

INSPECTION AND DESIGN.

As the work has grown, it has necessarily cast an increasing burden upon the Inspection Department. About a year ago Sir Sothern Holland and Sir Harry Ross Skinner were asked to leave the Explosives Department and to undertake the direction of the rapidly growing work of inspection. Its growth has necessarily been great not only because of the increasing magnitude but because of the increasing diversity of the munitions supplied.

In July, 1915, the staff of the Department consisted of 8,761 persons. It now consists in this country of nearly 40,000, with an additional staff in the United States of America of more than 8,000. We have sought to employ women in every possible way. In March, 1916, they composed 28 per cent. of the staff: they now compose 61 per cent., numbering 29,000, and they are employed on almost all operations except those in which special technical experience or physical strength are required.

The work of inspection, I am afraid, is often very tedious and monotonous. When we remember that there are no fewer than 183,000,000 separate

gauging operations for every million rounds of 18-pounder shell—which is no great quantity nowadays—we get some glimpse of its monotony.

Inspection is necessarily very closely associated with design, which is under the charge of General Bingham. This, too, has undergone substantial development. During the last twelve months, many of the former prolonged experiments and tedious trials have come to fruition, and the perfection of our present ammunition is due to the increased expertness and careful collaboration of the staffs of the Design, Inspection, Supply and Filling Departments, as well as to the growing expert experience of those concerned with manufacture. During the Battle of the Somme, we were constantly receiving reports both from our own side and through prisoners that we were still firing a considerable number of rounds of ammunition—not a high proportion, of course, but still many in the aggregate—which failed to explode, or which burst prematurely. The increase in the quantity of the ammunition supply has happily coincided with the improvement in its quality, and we have lately received enthusiastic reports from Sir Douglas Haig on the accuracy and on the fine detonating quality of the ammunition supplied, whether used for wire cutting, barrage, or for any other purpose. About a year ago the premature bursts of shells were at least ten times as frequent as they have been during the recent offensive, and the damage accordingly to our guns from this cause has become almost negligible.

DEVELOPMENTS IN GUN SUPPLY.

The Gun Supply Department during the past year, under Sir Charles Ellis and Colonel Symon, has had thrown upon it one of the most difficult tasks assigned to the Ministry. The plant required is so large and so extensive and, in some respects, the degree of skill required is so high, that the factors limiting output are specially difficult to overcome. It is well known, also, that guns of British manufacture are to be found both on the Russian and on the Italian fronts.

Demands for guns for anti-aircraft purposes and for the arming of merchant ships have placed a particularly heavy strain upon our capacity for producing long-range guns for use in the field. With the increase in the number of guns in the field, also the work involved in making good wear and tear and in providing for repairs has grown in proportion. Lately I have associated Sir Glynn West and the many factories of his department with this work.

Our output of machine guns and rifles under Mr. Alexander Duckham has been fully equal to the demands made upon us for these arms. The output at Enfield has increased tenfold, and our capacity for the production of machine guns weekly is more than twenty times greater than it was two years ago. Some months ago, also, our output of small arms ammunition became so abundant that we ceased to require any assistance whatever from outside this country.

Let me here pay a tribute to our great arsenal at Woolwich, to which we are indebted for almost all kinds of munitions and for the performance of work of the most highly-specialized and skilled kind, including the preparation of drawings, specifications and the working out of the details of the new types in which such great advances have been made during the past year. In August, 1914, the staff consisted of 10,866 persons; now it amounts to 73,571. The number of women employed in 1914 was 125; now it is close on 25,000. Many new shops have had to be built and equipped, and thirty-one canteens have been provided to assist in the provisioning of the workers, many of whom have to come from considerable distances, although we have undertaken extensive housing work in the neighbourhood. Most of this development has taken place under the superintendence of Sir Vincent Raven, whom, with some misgiving, in view of urgent necessity, I have recently lent to Sir Eric Geddes, the new Controller of the Navy. Colonel Martel has been appointed to succeed Sir Vincent Raven.

GLASS FOR OPTICAL INSTRUMENTS.

We have concentrated the supply and testing of master gauges at the National Physical Laboratory at Teddington under Sir Richard Glazebrook, and the skilled work done there suggests another section of supply that is of first-class importance, not only for war purposes, but for the establishment of industries of permanent value in peace time. I

refer to the section under Mr. Esslemont, which is charged with the supply of scientific instruments. Gun sights, apparatus for aeroplane photography, for telegraphic work, for commercial and scientific glass and for a host of other purposes are supplied by this branch. Its triumphs have been due to the enthusiastic co-operation of scientific men, of makers, of workers and of the training schools. One illustration must suffice. Before the war we could rely on British sources for only about 10 per cent. of the glass used in optical instruments, being dependent mainly on German and Austrian supplies. Our manufacturers now have been brought together and immensely strengthened. Difficult formulæ have been worked out, especially by Professor Jackson and his colleagues, and, under comprehensive arrangements, we not only have adequate supplies for ourselves, but are able to provide substantial assistance to our Allies. A whole group of industries connected with the glass trade has been placed on a secure foundation.

THE GREAT PROVIDER.

The Machine Tool Department, under Mr. Herbert and his Advisory Committee, is the servant of all and, like the last-mentioned, makes special demands on skilled labour. Every variety of machine, from the smallest tool or lathe to the mightiest crane, is provided by this department. In order somewhat to relieve the pressure upon it, we recently established a Machine Tool Clearing House under the



Vickers, Ltd.

MAKING BIG GUNS FOR THE ALLIES.



SCENE IN A MUNITION FACTORY.

Vickers, Ltd.

superintendence of Sir J. Stevenson and Captain Kelly, by which we investigate and examine idle and insufficiently used machinery and try to divert it to a better use. During the past seven months this branch has investigated 22,027 applications and succeeded in releasing 42,638 machines, roughly valued at £3,129,000.

RAILWAY AND MOTOR TRANSPORT.

I now come to the group of departments that require the use of steam or internal combustion engines. These are the departments for the supply of railway material, motor transport, tanks, agricultural machinery, and aeroplanes. With the exception of tanks, the responsibility for all these supplies has been added to the Ministry during the past year.

The other day Sir Douglas Haig paid a high tribute to the work of military transportation. It has been the duty of the Ministry to supply the goods, except that the transfer to France of a certain amount of existing railway stock was undertaken by the Railway Executive Committee. There are few more thrilling stories in the history of the Ministry than how Sir Ernest Moir and his colleagues succeeded in a short time in meeting the demand.

The number of locomotives and trucks, with the track required, was so great that to manufacture all in time—even if there had been the raw material to spare, which there was not—would have been an

impossibility. We had therefore to obtain the balance from existing stock where we could. Track was pulled up at home. India, Australia and Canada sent their contributions. The Government of Canada held a meeting, and within forty-eight hours had arranged, if we wanted it, to pull up 800 miles of track and ship it complete. More than 2,000 miles of track have already been supplied in a complete condition, and nearly 1,000 locomotives of different kinds, apart from hundreds supplied by the Railway Executive Committee.

Motor transport was transferred to us last year, and was at first under the charge of the President of the Board of Trade. It is now directed by Colonel Holden, under the superintendence of Mr. Percy Martin, the Controller of Internal-Combustion Engines. The British Army is well supplied; and we are also able to render much assistance to our Allies in this department.

AGRICULTURAL IMPLEMENT SUPPLY.

Agricultural implement supply became one of our duties in the late autumn, and Mr. Edge, who is in charge, has the assistance of a small committee of agricultural implement makers who responded to our request for assistance with the same readiness that has always been accorded whenever we have asked business men to come to our help. Most of the large agricultural implement makers had previously become considerable suppliers of munitions and extensive re-arrangements of work have been

rendered necessary in order to meet the large programme put forward by the Food Production Department.

TANKS AND AEROPLANES.

The tank made his appearance last autumn. I say "his," although we distinguish a male and a female variety. At the close of last year much work required to be done in the way of alteration and improvement, as the experiences of the Somme suggested, but the supplies of the new designs are coming forward excellently. The end of the story is not yet, for the enthusiasm of Colonel Stern, Sir Eustace D'Eyncourt and their colleagues knows no limits.

When early in this year the Ministry of Munitions was asked to undertake the supply of aeroplanes and seaplanes for the Army and the Navy, it became evident that the mobilisation of all our resources for the production of internal combustion engines under a unified scheme of direction was essential. A working relation with the Air Board was established, and the production of all internal combustion engines was placed under the direction of Mr. Martin, who left the B.S.A. Company and the Daimler Motor Company to join the Ministry for this purpose. Formerly there were many shops which were producing a number of different types of engines. By a continued effort to diminish the number of types and to concentrate on the best, with a policy of securing that one shop shall be devoted to the production of only a single type of

engine, we have already obtained an enormous increase in production, apart from the addition either of machinery or labour. At the same time, I asked Sir William Weir, who had done such good work for us as Director of Munitions for Scotland, to take charge of the supply of aeroplanes and seaplanes. He and Mr. Martin became members of the Air Board and of its Technical Committee, not only as representatives of supply, but so as to establish a close working relation between the manufacturing side under us and the formulation of programmes and designs which belongs to the Air Board. Under Sir William Weir's direction, the output of aeroplanes is rapidly increasing. The production for May is more than twice that of December and is four times greater than that of May, 1916. We must not, of course, lose sight of the share in these results which belongs to Sir David Henderson and those who were in charge of the work last year. The supply, however, will become much greater still in a few months' time, for we are working at a vast programme of production, and the plans we have in prospect provide for its full realisation. There is a pressing demand for skilled workers in this service, and, if they can be obtained, we may be sure of a supremacy in the air in material and equipment as emphatic as it is on land in the case of artillery.

INLAND AND OVERSEAS TRANSPORT.

The work involved in connection with the movements of overseas supplies, as well as with the move-

ments of ores, metals, machinery and other munitions in this country, has necessitated the provision of two further sections—one under Mr. Howard Williams for Inland Transport and another under Mr. Burton Chadwick for Overseas Transport.

In overseas supplies alone we are interested in nearly 1,500,000 tons of shipments monthly, and the submarine campaign, bad as it is, will not provide much comfort for our enemies when they know, for example, that of shell components shipped from North America to supplement home production the total loss since the commencement of the unrestricted submarine campaign, taking the heaviest item of loss in any single component, is only 5.9 per cent. of the amount shipped.

At the request of the Secretary of State, early in the year Sir Frederick Black and a small number of special officers went to India with a view to assisting the further development of munitions production by placing their experience at the disposal of the Government of India. Sir Frederick Black has now returned, and we are very hopeful that the valuable suggestions he has made will lead to good results.

AMERICAN AND CANADIAN SUPPLIES.

Our supplies from the United States until recently were arranged for, so far as purchase was concerned, through Messrs. Morgans, with separate organisations for supply and inspection. Lately, however, Mr. Gordon, the Vice-Chairman of the Imperial Munitions Board in Canada, at my request, has

moved to the United States, and has been appointed as the head of all our munitions organisations there. Mr. Gordon will report out there to Lord Northcliffe in the same way as the other chief British representatives in charge of shipping, transport, grain purchases, and other services. Some time ago also there was set up in London an inter-Allied Bureau on which our European Allies and ourselves are represented for the purpose of pooling our requirements in the American market as much as possible and for the avoidance of competitive buying. Negotiations are now proceeding at the suggestion of the United States Government for a further consolidation of interest, on this side as well as in America. The result of these negotiations, if successful, will be of enormous value not only in enabling the United States Government to place their great resources more readily and effectively at the Allies' disposal, but in promoting economy in purchase. These arrangements have been much facilitated by the work of Mr. Balfour's Mission, on which the Ministry was represented, amongst others, by Mr. Layton, the head of the Statistical Department, who also represented us with Lord Milner in Petrograd and with the Prime Minister in Rome.

The Imperial Munitions Board in Canada, under the chairmanship of Sir Joseph Flavelle, is now the greatest business organisation in the Dominion. More than 200,000 workpeople are employed by it, and their supplies, which cover almost the whole field of munitions, are dealt with on this side by the

Hon. R. H. Brand, who was at one time a member of this House.

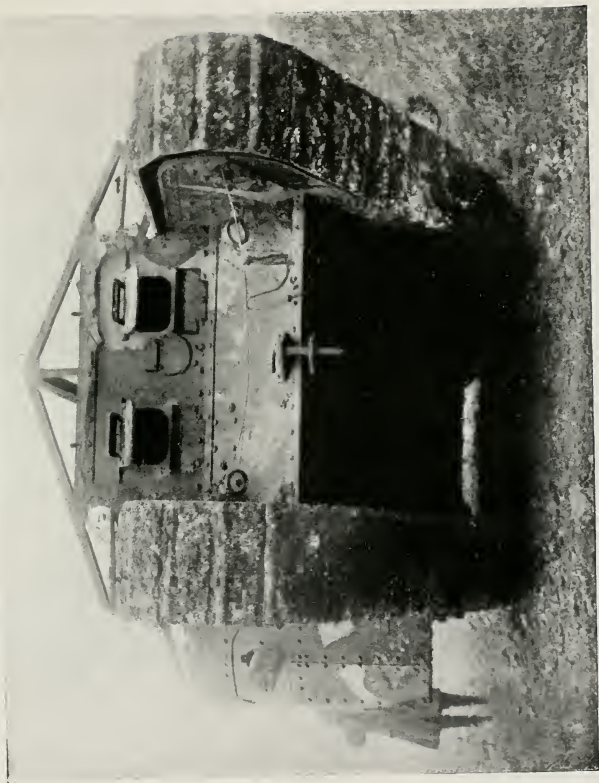
INCREASED OUTPUT OF STEEL.

Overseas supplies bring me to that group of Departments which is concerned with the supply, distribution, working up and control of the various necessary minerals and metals. Do what we will to avoid fresh burdens, the work of this group of Departments continues to grow from day to day, but there is nothing of more hopeful augury for the future than the proofs which we are thereby accumulating of the great undeveloped potentialities of our Home and Colonial resources.

Before the War, the output of steel in this country had been more or less stationary for some time—at a little over seven million tons per annum. The output is now nearly ten million tons and I shall be very much disappointed if, with the schemes which are now being worked at, we have not reached the rate of a twelve-million-ton output by the end of next year. We shall then have gone far towards doubling the pre-War steel output of this country and I do not need to emphasise all that is involved in this addition to our industrial strength and resources.

With the exception of the rich deposits in Cumberland, nearly all the iron-ore mined in this country is of a somewhat low grade and is of the basic variety as distinguished from the acid or hematite ores of Cumberland and those which form so large a proportion of our imports. As a result

of our great imports of hematite ores, many of the blast-furnaces and steel furnaces of the country have been specially adapted for its use and a more extensive use of home-produced basic ores involves important modifications in working plant. In order to make ourselves as safe as possible against the worst the submarines could do, I asked Mr. John Hunter, under whose strong leadership the whole of the Steel Department works, to have a comprehensive survey made as quickly as possible, with a view to making the utmost use of home ores in case the submarine menace proved effective in restricting importation. We do not aim at restricting importation, but we aim at increasing our steel supplies—and increasing them as rapidly as possible—by the use of home ores. Mr. Hunter got together a strong band of willing experts, the programme was rapidly formulated and the Government decided to use every endeavour to give full effect to it. The increased production of basic steel from home ores, with the consequent adaptation of old or the bringing in of new furnaces, should provide us with the capacity for the production in this country by the spring of next year of an additional one and three-quarter million tons of basic steel above our previous home production. Added to this, we propose an extended use of the hematite ore from Cumberland for the production of acid steel, provided the necessary labour can be obtained. I cannot pretend to give in this short summary any adequate impression of the enormous amount of detailed labour which the preparation and working



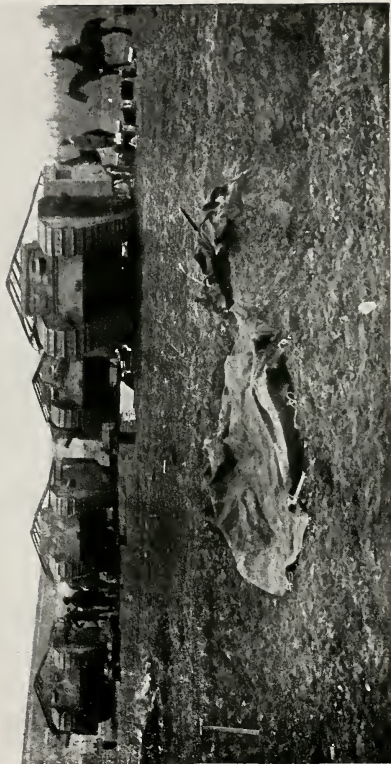
FRONT VIEW OF A TANK COMING OUT OF ACTION.



SCENE IN A SHELL FILLING FACTORY IN ENGLAND



ND. THIS LARGE STORE COVERS $9\frac{1}{2}$ ACRES.



HEAVY ARMoured CARS READY TO GO UP.

out of this scheme has involved and of the laborious days which have been spent in its elaboration by the gentlemen who have placed their services at our disposal ; suffice it to say that, within about fourteen months from the commencement of the scheme, we shall have increased our home capacity for the manufacture of basic steel by 30 per cent. The demands for steel are so many that we have had to make our control of this precious metal very close indeed, and I must acknowledge the loyal acquiescence of the great body of steel users in accepting the restricted allocations which the Ministry have been obliged to make. The demands, however, upon our steel-producing capacity are so great that, with all the help which we derive from Canada and the United States, I cannot, in fairness, offer any immediate prospect of relief.

A signal success with respect to the fixing of prices has been achieved in this branch of supply. Notwithstanding the costs of material and labour, we are obtaining steel plates in this country at less than half their cost in the United States, where shell steel also costs 30 per cent. more than it does at home.

PROFITABLE ENTERPRISES IN NON-FERROUS METALS.

The Non-Ferrous Metals Department is under the charge of Mr. Leonard Llewelyn, and is responsible for our supplies of spelter, aluminium, copper, tungsten, brass, antimony, lead, nickel and other metals. The production in this country before the war of spelter or commercial zinc was only about

one-third of our national requirements. Before the end of the present twelve months I hope that the country will have double that capacity, and I believe that the new works will be found not only designed on the most modern lines, but capable commercially of holding their own with any spelter plants in the world. A part of the scheme involves the working up of the Australian zinc concentrates, which were formerly largely under German control, and we have in hand some schemes for increasing the output of refined spelter, both at home and in Canada.

Some time ago steps were taken to obtain control of the wolfram ores in the Empire with a view to regulating the stocks of tungsten which are necessary for the production of high-speed steel, and if anyone cares to compare the price of the high-speed steel that we are obtaining in Sheffield with the price in New York, I think he will be satisfied that the country is enormously profited by these enterprises.

Works have been established at home for the production of tungsten which enable us fully to meet our own requirements and to supply much besides to our Allies.

By a system of rationing of aluminium supplies we have converted a deficit into a surplus. At the same time, steps are in hand which will increase the home production of aluminium by 45 per cent. as compared with pre-War days. The control of copper has been one of special difficulty and complexity. The arrangements made have certainly enabled us to avoid in a great measure some of the

penalties of the very high prices which have prevailed, but there are few important metals of which there is greater need for scientific and methodical development in this country than is the case with copper.

DEVELOPMENT OF MINERAL RESOURCES.

So much impressed have we become with the importance of rendering this country in the present emergency as independent as possible of foreign supplies of minerals that a short time ago we invited a small committee of engineers and mining experts, under the chairmanship of Sir Lionel Phillips, to collect information and to make proposals, under a unified scheme, for the development for war purposes on commercial lines of the mineral resources of the United Kingdom. Much useful information has already been collected, and we anticipate very valuable results from the work of this committee.

Owing to the insufficiency of the world's supplies of certain metals for munitions and for all commercial purposes, we have had to establish an elaborate system of priority certificates, and some little time ago, at the suggestion of Mr. Edgar Jones, M.P., the Controller of this Department, after a conference with our Colonial representatives, arrangements were made for the Colonies and India to co-operate in the examination of their demands upon us on lines similar to those we have adopted at home. The Priority Department has to adjudicate on an average upon more than

9,500 applications per week. It has about 1,000 individual interviews with representatives of firms every week, and its control extends over steel, iron, copper, lead and other metals, as well as over numerous alloys.

Some time ago, in order to be as secure as we could that this work was carried out with a minimum of hardship to private trade, I instituted a standing Priority Committee of business men, under the chairmanship of Mr. John Wormald, of Messrs. Mather and Platt, to examine and advise upon various schemes of priority as they affected individual industries. The trades that have been examined cover a large variety of industries, from the manufacture of washing machines to that of jewellery.

SCRAP COLLECTING AND SALVAGE.

Priority is one method of effecting economy in the use of metals. Further help has been given by the institution of a system of scrap collecting and distribution. This is now getting into working order throughout the country under the direction of Mr. Alexander Walker, and it should lead to an extensive cleaning up of the masses of scrap of all kinds which may still be seen in some places and in various munition works.

With a view also to rendering further assistance in this direction, we have established an extensive Salvage Department, under Sir Charles Ellis, which works in co-operation with the armies at the front for the salvage, re-shipping to this country, re-

forming and re-issue of a large number of parts of munitions. We are now able to re-form hundreds of thousands of 18-pounder cartridge cases. When it is remembered that the price of a new case is about 7s., that it can be re-formed four times, and that we are re-forming cases at the cost of 4d. a case, the importance of this branch of work is obvious.

As another contribution towards the saving of metals, an expert committee, presided over by Mr. Fielding of the Rio Tinto Corporation, and working in conjunction with the Designs Department, is now charged with the duty of making recommendation for economising the use of the more expensive metals. Largely through the efforts of this Committee we are securing a reduction in the amount of copper used in copper-bands, amounting to a saving of many thousands of tons of copper in a year ; and less expensive metals are now being brought into use as constituents of various fuzes and other shell components.

NEW INVENTIONS.

Many useful suggestions in the direction of economy and for the utilisation of cheaper materials have been received from the Munitions Inventions Department under Colonel Goold-Adams. There is still a steady stream of suggestions and more than 6,000 have been reported on since the beginning of the present year. Many valuable contributions have been made over a wide field, varying from improvements in scientific instruments and

modifications in defensive and offensive apparatus to economies in the use and treatment of fuel. In sixty-five cases special rewards have been made to employees of firms for useful suggestions.

And here I should like to make a passing reference to the fact that attempts are being made to promote the production of nitrates at home with the avoidance of importation, in accordance with proposals founded upon the work of the Nitrogen Products Committee—a committee which consists of a number of eminent engineers, manufacturers and scientific men, under the chairmanship of Colonel Goold-Adams.

Special efforts are also being made in these islands for the development of oil production. Thanks largely to the tact and knowledge of Professor Cadman, we have already promoted an excellent working arrangement between the workpeople and employers in the Scottish shale districts, which has resulted in a great economy in the methods of production, as well as in an increased output of oil. Subjects such as these have necessarily led us to appeal for the aid of a large number of scientific men, especially chemists, physicists and engineers, and we have not appealed in vain.

SUPERIORITY IN TRENCH WARFARE.

The Trench Warfare Research Committee, under the chairmanship of General Jackson, has been responsible for the initiation and development of the more highly specialised forms of warfare which are peculiar to the trench fighting on the Western

Front. I cannot, of course, describe in detail any of the newer developments, but I can say, with confidence, that although we started behind in the race, we are probably now as superior to the Germans in this section of warfare as we are in that of artillery.

The Trench Warfare Supply Department, under Sir Alexander Roger, covers an enormous variety of supplies from fireworks and grenades to the heaviest form of bombs, also helmets, shields, specialised chemical apparatus, trench mortars and their ammunition. This Department has supplied one and a-half million steel helmets during the past six months. As an illustration of the increasing demands of the Army for Trench Warfare material, I find that in December the tonnage requirements amounted to 7,648 tons, whilst last month it reached 17,963 tons.

THE WELFARE OF THE WORKER.

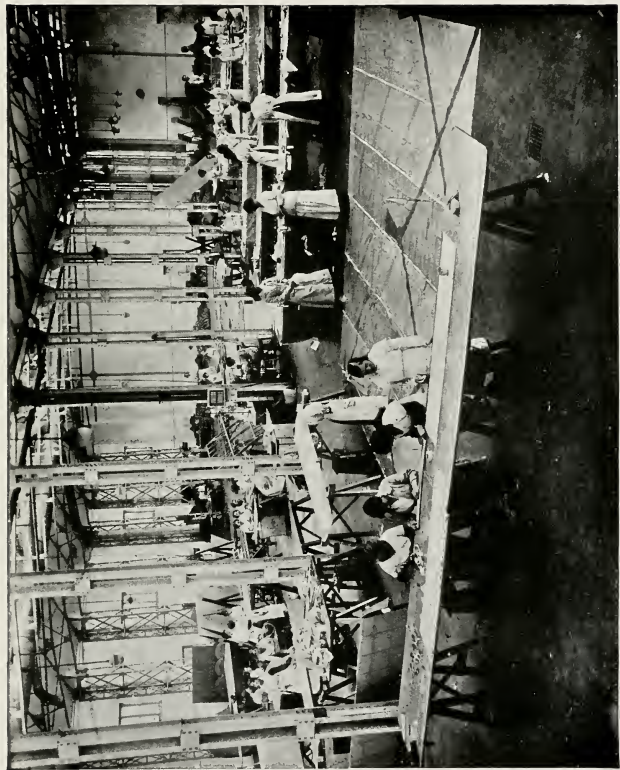
The Trench Warfare Department of the Ministry has brought us into contact, in some of its branches, with manufacturing problems of a peculiarly difficult and often of a dangerous kind, and we have received much help from the branches of the Ministry which had special charge of the welfare and the health of munition workers. The Health of Munition Workers' Committee, under Sir George Newman, has produced a number of valuable Reports, and has been instrumental, I think, in establishing principles which will continue to be applied long after the war. More than 600 firms have appointed supervisors

whose sole duty is to promote the welfare of their workers, and great benefit has resulted in different directions. It will be evident that questions associated with food, clothing, light, ventilation, rest, and so forth arise almost in every workshop, and there has been friendly co-operation between the staff of the Ministry dealing with these special problems and the Department of the Home Office that is concerned with factory administration. Should they be necessary, schemes have been prepared in connection with the feeding of munition workers which have regard to the arduousness of the labour on which they are engaged.

Last year the problems arising out of the handling of T.N.T. and other poisonous explosives became somewhat acute, and I appointed a special committee, under the chairmanship of Dr. W. M. Fletcher, Secretary of the Medical Research Committee, to investigate them and make recommendations. The efforts of this committee, in conjunction with the Filling Department, have resulted in the application of suggestions which have been accompanied by an enormous diminution of the cases of illness. We have found here, as we have found often enough before, that the problems of prevention when understood are simpler than those of cure.

LABOUR SUPPLY.

In the early days of the Ministry we were confronted with a demand for labour amounting to many hundreds of thousands of workpeople. But



WHAT THE DAUGHTERS OF BRITAIN ARE DOING. GENERAL VIEW OF AIRCRAFT FABRIC WORKROOM.



Ernest Minter

WOMEN WORKERS IN A BRITISH SHELL FACTORY.

the work of the Ministry has almost doubled within the last twelve months.

At the beginning of this year we found that the Aircraft Supply programme would require at least 10,000 additional workers, many of them skilled ; and what applies to aircraft applies to shipbuilding, gun manufacture, tanks, agricultural implements, and many more supplies.

In connection with the development of iron-ore at home, we have received great assistance in the recruitment of men in the china-clay districts in Cornwall who have volunteered to move into iron-ore districts. Some hundreds of them have already taken up the work. In co-operation with the Coal Controller, steps are being taken to draft into those districts where the iron-ore is mined a number of men experienced in mining. I should like here to mention, as one of the most gratifying interviews I have ever had on labour questions, a deputation which I recently received of the joint employers and employed from the Cleveland iron-ore district. During the discussion, it appeared that they had not had a strike of any magnitude in that trade for nearly forty years, and when one saw the spirit and traditions which had been established between the two parties, manifested in the patriotic way in which they tried to meet our demands, no surprise could be felt at their record.

WOMEN'S WORK AND MOBILE LABOUR.

If we have regard to the upheaval it has involved in industrial methods we may claim, I think, that

the widespread employment of women in munition work has been attended with singularly little difficulty. From 60 per cent. to 80 per cent. of the machine work on shells, fuzes, and trench warfare supplies is now performed by women. They have been trained in aeroplane manufacture, in gun work, and in almost every other branch of manufacture. It would have been quite impossible to meet the demands by any of the available mobile labour without training others, and bringing into operation a large body of labour previously inexperienced. This necessity has cast a large burden upon the training section of the Ministry, which has operated to supplement the training which goes on in the works. More than sixty technical schools and colleges in Great Britain are used in this work. We have trained more than 32,000 workers in these places. There are also five special industrial factories engaged in training. Nearly 8,000 people trained in specially difficult processes have been placed in employment this year and we have contributed 1,450 trained mechanics to the Royal Flying Corps.

Three other sections of the Ministry have been in constant operation to supplement that which is done either by dilution or training. There are 38,000 skilled workpeople employed away from their homes as War Munitions Volunteers, and I cannot pay too high a tribute to the loyal manner in which they have observed their undertakings and been willing to move as the urgency of one part of the munition programme may have acquired priority

over that of another. There are also over 40,000 soldiers who have been released from the Colours and have similarly placed themselves at the disposal of the Ministry. In addition, more than 30,000 Army Reserve Munitions Workers have been placed on work of construction in the steel trade and elsewhere. It would have been impossible to have met the ever-changing and growing programme without this large body of mobile labour, and I cannot refrain from a heartfelt tribute to the work of Sir Stephenson Kent and his colleagues who have had charge of Labour Supply.

DILUTION IN PRIVATE INDUSTRY.

In the nature of the case, the Ministry cannot escape so long as the war continues from the difficulty of having to meet great programmes of supplies of all kinds, and the demands of the Army for reinforcements. The perplexities and difficulties which these conflicting problems present can possibly be imagined, but they are very difficult to describe. After consideration of them all in October of last year, the Man Power Distribution Board recommended the Cabinet to suspend the issue of badges, and, at the same time, to secure the retention in industries of the necessary supply of skilled workers. With a view to meet the difficulties which afterwards arose in this connection, the Trade Card Scheme was negotiated. It was found that the release of men strictly according to age groups in some of the most important industries, such as the

electrical trade, the magneto industry, aeroplane manufacture and others which are relatively new, and therefore largely staffed by young labour, presented special difficulties and had necessarily to undergo some modification when it was tried last December. The Man Power Distribution Board also, after a careful examination of the case, came to the conclusion that the only available source for the skilled labour required—at all events in some industries—must be derived from private and commercial work, and recommended that the methods of dilution, under proper safeguards, should be extended thereto. The need to-day is much greater than it was then.

Apart from the difficulties inherent in the administration of any exemption scheme, the Ministry, along with other departments, was instructed by the War Cabinet early in this year to provide a certain quota for the Army during the coming months, and this, apart from other difficulties, compelled a revision of the Trade Card Scheme. We are making special efforts to deal comprehensively with the whole issue of organised skilled labour at the present time, and have decided to make drastic modifications in the Munitions of War Act in an effort to provide a working scheme which, whilst giving us the skilled labour which we require, with adequate safeguards, will go far, I hope, to remove the hardships and difficulties which have inevitably been involved in the administration of the Munitions Act itself.

DISPUTES, WAGES, AND SAVINGS.

It would be unfair to the Disputes section of the Ministry under Mr. Wolff not to give some indication of the extent of its work. Let me say at once that if it were possible to start again with a clean slate, I should welcome a scheme whereby all labour disputes for all Government departments were dealt with in one department. But a department which is responsible for the employment of two million persons, and for keeping the products of their exertions up to a level which continually rises, cannot escape from responsibilities that attach to every good employer of labour.

We have dealt successfully in the Disputes branch with more than 100 disputes on an average every month which have been accompanied by short cessations of work. I find that during the first five months of 1916 the number of working days lost through suspensions of work was 1,559,900, which itself is less than one-quarter of the figure for the same period in 1914. During the same period of the present year, however, notwithstanding all that we hear against the Munitions of War Act, the figure has fallen to 540,700—or only one-third of what it was a year ago. There are forty-five local Labour Advisory Boards, many of which have rendered invaluable service. We have to administer and apply to our workers, for example, the 1,500 awards which were given by the Committee on Production during 1916. There are about 230 cases dealt with per week under the Fair Wages

clause, and we have, on the average, to adjust and deal with awards, apart from the Fair Wages awards, at the rate of four every day. These are for the most part separate from the findings of the special tribunals and the orders issued as the result of their findings affecting the wages of women. These latter awards have now been applied to more than 90 per cent. of the women employed on munition work in controlled establishments, and some conception may be formed of the magnitude of the achievement as it affects women's wage when I say that before the War the average wage for women employed by time-rate, doing 48 hours a week, was 12s. a week. At the present time, the lowest rate for time-work for adult women is 22s., and the average rate for women time-workers is 25s. a week.

As to savings, Major Scott, our commissioner on the National War Savings Committee, reports that those connected with munition work are known to have contributed no less than £40,187,381 either directly to the War Loan or through certificates issued through the Boards of Management.

THE CONTRIBUTION TO INDUSTRIAL METHOD.

The Labour Department of the Ministry of Munitions has come in for a good deal of criticism lately. We have made our mistakes; who would not? We know much more about them than those outside. But we are entitled to ask our critics and others to look at the magnitude of the difficulties, and the enormous extent and variety of our opera-

tions, and to bear in mind the thousands of cases in which adjustments are smoothly arrived at.

One day you are confronted with a demand for aeroplane workers, another day it is an augmented production of chemicals for smoke clouds, another day it is acetylene welders that are wanted for bombs or mines, another day it is workers in T.N.T. and poisonous compounds, then it is a demand for long-range guns, then for agricultural tractors, then for iron-ore workers, and so on and so on, requiring ever-changing adjustments and improvisations—time-rates, piece-rates, movements of labour and all the rest of it.

We face our critics without apology, and we shall find, I believe, that in the rates of pay of women workers, in the reduction of the hours of labour and in humaner methods of employment, as well as in many other directions, the Labour Department of the Ministry of Munitions has made an enduring contribution of high value towards our industrial methods.

HOUSING AND OTHER BUILDING SCHEMES.

The employment of so many workers, especially women, away from their homes raises social and other problems which are very difficult to deal with, and there are few questions of administration which cause one at times more anxiety.

It is our duty to do the best that can be expected of a good employer, and also to recognise the

responsibilities which belong to the State. But the difficulty of obtaining personal and tactful assistance of the right kind, properly directed, and without interfering with the proper liberties of the subject, raises a number of personal and human issues which are very difficult to adjust. If you leave it simply to the voluntary effort of the locality, you will find sometimes that it is done very well ; in other cases, the work is not done at all ; and sometimes it is over-done.

Our Housing Schemes fall into three groups :—

(1) Those in which, by Government contribution, we have assisted local authorities or others to provide permanent housing ;

(2) where the Ministry itself has constructed temporary cottages or hostels ; and

(3) where we have taken and adapted for munition workers existing accommodation.

The management and administration of some of these new townships—for they amount to little less—have been greatly assisted by many business firms, by workers' organisations, co-operative societies and volunteers, and I should like to take this opportunity of thanking them for what they have done or are doing.

The establishment of canteens has made great progress during the last twelve months, and I find that altogether in controlled establishments and in national factories canteens have now been provided for supplying meals to 810,000 workers daily.

The commitments of the Ministry with respect to new buildings or extensions of factories are so numerous and were made in the emergencies of the War under such diverse conditions that I recently asked a number of gentlemen from outside who had had the necessary technical and business experience to devote themselves, under the chairmanship of Mr. Palmer, of Messrs. Rendel, Palmer and Tritton, to the examination and control of all works of building and extensions undertaken or assisted by the Ministry both from the structural and financial point of view, as well as from the point of view of their necessity. It has involved a very heavy burden of work, but I am glad to say that substantial progress has been made. The Controlled Establishments Branch, under Mr. Owen Smith and his advising accountants, is necessarily closely associated with this side of our work.

EXPENDITURE AND THE SCRUTINY OF ACCOUNTS.

The expenditure of the Ministry on extensions has been great, but by far the most considerable item of the enormous expenditure for which we are responsible is that connected with the supply of gun ammunition.

We have done our best to reduce the cost of shell components, and the cost of ammunition during the past year, as compared with the cost that the same amount would have involved at the prices of the previous year, represents a saving of £43,000,000. But I am sorry to say that our best efforts in these

directions, in view of the increasing extent of our work, afford no prospect of reduction in the total expenditure. The control of this enormous expenditure imposes great burdens upon the Finance Department, the charge of which devolved upon Mr. John Mann after Sir Hardman Lever left us.

A short time ago a reorganisation of the Store-keeping and control was instituted under Sir Harry Ross Skinner and Major Cripps, and, at the same time, I invited some eminent accountants from outside to devote themselves to the scrutiny and supervision of Stores accounts. Mr. Garnsey, of Messrs. Price, Waterhouse and Co., and Mr. Guy, of the Nurneby Company, U.S.A., are specially in charge of these duties. The magnitude of their task may be imagined when I say that our different stores cover a floor area of 5,000,000 square feet; that we make more than 60,000 individual consignments each week; and that the number of articles handled each week by the Stores Departments exceeds 50,000,000.

The complexity and difficulty of the checking and control of this expenditure and material is hard to describe, and we welcome every useful suggestion which makes for its more efficient discharge.

In order that we might have constantly with us a body of men able to devote themselves free from office duties to the consideration of these problems, I set up a few weeks ago an Advisory Committee on Finance under Sir Clarendon Hyde, consisting

of a small number of gentlemen experienced in these matters. In many directions, the cost accounting and financial methods which have been adopted have not only provided considerable savings but have improved methods of manufacture. At the same time, in this gigantic business, involving as it does the purchase, collection, distribution, supply and checking of innumerable items, waste and oversight is bound to occur, and we should aim progressively at the adoption of methods which automatically prevent their occurrence as far as possible.

DIRECTION AND CONTROL.

Now I may refer in a few words to the methods we adopt to secure direction and control in our great and constantly changing responsibilities. So far as possible allied departments are grouped under a number of Directors-General, certain groups reporting to each of the Parliamentary Secretaries, Mr. Kellaway and Sir Worthington Evans. In some cases, as I have indicated, those in charge of associated groups meet for the consideration of their common problems, whilst special committees deal with questions which arise in particular departments. In order, however, to secure the consideration of big problems affecting many departments, or the Ministry as a whole, we have a Ministerial Advisory Committee, consisting of Sir Arthur Duckham as Chairman, Sir James Stevenson as Vice-Chairman, with Sir Frederick Black,

Sir Stephenson Kent, Sir Ernest Moir, and Sir Alexander Roger as members.

These gentlemen have considered and recommended schemes for dealing with many of our greatest and most difficult problems, such as those raised by the addition to our duties of aeronautical supplies, by the control of metals, the regulation of stores, and a large number of kindred subjects, and I cannot speak too highly of the help which they have ungrudgingly rendered.

The Ministry presents perhaps the most remarkable aggregation of men and women of diverse qualifications and attainments that has ever been got together in this country. Men from every branch of commerce and industry are serving with us, often as volunteers; scientists, lawyers, literary men, commercial men, travellers, soldiers, sailors, and I know not what besides are working in our ranks, and worthily have they served the State.

THE PROBLEMS OF RECONSTRUCTION.

From what I have said it will be recognised that the problems of reconstruction, and the possibilities of useful developments which the experiences of the Ministry have provided during the last two years, are so many and of such great moment that they may well engage the constant attention of the best minds. Whilst, with true British instinct, we dwell upon our faults and failings, nothing throughout the War has been of greater value than the proof which has been afforded that, given the incentive and the

intention, the nation is abundantly equal to making a full use of the lessons and of the opportunities that present themselves.

Nothing in the relations between Capital and Labour gives rise more to difficulty and distrust than two customs which are dependent upon one another. The first is the cutting of rates of pay on piece work so as to limit the rise of earnings when improved methods of manufacture, leading to a great output, are introduced. It is not the practice of the best employers, but it is adopted by many. This practice—or the fear of it—has inevitably led to the second and retaliatory practice of the restriction of output. The influence of these two practices in our industrial life is thoroughly poisonous. We must establish a system whereby both parties have a direct interest in the introduction of improved methods. Without it our progress will inevitably be accompanied by endless disputes. The accounting side of the Ministry has abundantly proved that modern methods of production are not only well able to afford good wage rates, but are benefited by so doing.

REDEEMING NEGLECTED OPPORTUNITIES.

In some industries, vital to the prosecution of the War and to the maintenance of improved peace industries, we had allowed the Germans to acquire control, either of the whole industry or of some part of it which was essential to its continuance. We have steadily overcome these drawbacks, but it is almost

impossible to describe the handicap they have been. In overcoming them, however, we have been awakened to some of our neglected opportunities and have founded—and will be able to found with proper direction—great new industries and extensions on a vastly improved scale of old ones. Should the War last, we ought to find ourselves next year with a capacity for steel production more than 50 per cent. greater than it was before the War, with modern coke ovens, equipped with recovery plants, with knowledge of how to extract and use the valuable by-products, with groups of blast-furnaces, steel furnaces and rolling mills arranged on a big scale, suitably situated and co-ordinated with one another. Instead of being able to produce at home about one-third of the spelter that national industries require, we should have a capacity for producing two-thirds or more. Instead of having to look to Germany for our fertilisers, we should be able to produce at home spelter and acid and fertilisers and many other products related to these trades by modern, economical, and efficient methods on a vastly augmented scale.

At the beginning of the War we found ourselves with no facilities to smelt the copper produced in our own colonies. We were dependent upon Germany for the potash so vital to some of our industries and to our agriculture. The story of glass and dyes is so well known that I need do no more than refer to it, and the catalogue could be continued to a great extent. There are, however, two matters of great moment to which I should like

specially to allude. We have had to import nitrate from Chili and pyrites from Spain, for practically every ton of essential nitrates that we require. I have good hope of the schemes which are at present in hand for the use of gas-works ammonia and for the production of cyanamide, as well as otherwise for obtaining nitrogen. Germany is obtaining all her nitrates without a cargo from Chili. The importance of the solution of this problem as a key to immense industries can scarcely be exaggerated, and no effort should be spared to solve it on commercial lines.

The other problem of equal magnitude and, in some respects, closely related, is the provision of cheap power and the utilisation of inferior coals. I cannot go into details, but important developments are in progress, and it is most important that no effort should be spared to bring them to a successful issue.

We have suffered in the War not only from old-fashioned plant and negligent financial methods but from a serious neglect of research and scientific work as applied to industry, and I should like to acknowledge the help which has been afforded by the Committee on Scientific and Industrial Research, in the origin of which I may perhaps claim some parental pride. Our manufacturers are awakening to this need, and so is labour, and I cannot think of any national investment worthier of thought and of cost than this one.

A number of the chief men of the different departments of the Ministry are at work on plans

for reconstruction, and there is a Ministry Reconstruction Committee to secure uniformity of direction in accordance with an arrangement made with the Central Reconstruction Committee. The destination of our national factories will at once suggest itself as an important matter for consideration, but others are emerging which may be of greater consequence even than this.

The War has revealed that a certain measure of central control and common direction may place at the disposal of individual effort opportunities otherwise quite unattainable.

The flow of demands in the Priority Department points to an opportunity of securing a great volume of useful commercial work for this country. The flow of foreign orders, demands for restoration abroad, the needs of our railways and shipyards and common service undertakings show that there are abundant opportunities before us. If preparations are made beforehand, it should be possible, by a wise administration, to help in bridging over the transition between the disestablishment of the industries of War and the establishment of those of peace. At the direction of the Imperial War Cabinet, the Ministry is taking steps which will assist in providing information on commercial lines as to the mineral resources of the Empire. We want information which will be available not simply in general terms, but examined and proved, so that we may be able to know not only what resources there are, but by what methods and at what cost they may best be developed. There are mineral

resources at home, which have been scarcely tapped, and what applies to these small islands applies with much greater force to the almost infinite resources of the British Empire.

THE FORWARD LOOK.

These things are worthy of the sustained attention of the best minds the nation can command, and we should consider them not from any narrow profiteering standpoint, but in such a way as will enlist the help and sympathy of all classes.

As we review them and reflect upon all the possibilities of development, both in material and in human things which they disclose, we gather, amidst our labours, further resolution, and take fresh courage in our determination to endure until, in company with those who are fighting with us, we have put down military tyranny in the world and have thus removed the one great obstacle in the way of real human advancement.

The minds of men are open, all hearts are stirred, and the power and capacity of our people is proved to be so great and so sufficient that, properly directed, patiently, with consideration and with careful forethought, the end is sure.

We look forward, therefore, to the future with a confidence made strong by the experiences and work of this great Department, the record of whose achievement is to be found, not in this incident or in that, not merely in great industrial advances at home, but in far distant lands, at the gates of

Gaza, on the hills of the Carso, on the stricken fields of France and Belgium, wherever the British Army is to be found—an Army which in its equipment of munitions is now equal if not superior to any other army in the world.

